

CLAIMS

What is claimed is:

1. A plant comprising:

5 a first absorber fluidly coupled to a regenerator, wherein the first absorber is configured to promote absorption of hydrogen sulfide by a hydrogen sulfide-selective solvent, and wherein the regenerator is configured to promote formation of a hydrogen sulfide-rich gas from the hydrogen sulfide-selective solvent;

10 a second absorber fluidly coupled to the regenerator, wherein a portion of the hydrogen sulfide-rich gas is fed to the second absorber to thereby increase a hydrogen sulfide concentration in the hydrogen sulfide-rich gas; and

wherein the first and second absorbers are configured to produce an overhead product that is enriched in carbon dioxide and substantially depleted in hydrogen sulfide.

15 2. The plant of claim 1 wherein the first and second absorbers produce a first and second hydrogen sulfide-enriched solvent, and wherein the first and second hydrogen sulfide-enriched solvents are combined.

3. The plant of claim 1 wherein the first and second absorbers produce a first and second hydrogen sulfide-enriched solvent, wherein the first and second hydrogen sulfide-enriched solvents are combined, and wherein the second absorber receives at least a portion of the combined hydrogen sulfide-enriched solvents.

20 4. The plant of claim 1 wherein the first absorber produces a first hydrogen sulfide-enriched solvent, and wherein the second absorber receives at least a portion of the first hydrogen sulfide-enriched solvent.

5. The plant of claim 1 wherein another portion of the hydrogen sulfide-rich gas is fed to a Claus plant.

25 6. The plant of claim 5 further comprising a third absorber that receives a tail gas from the Claus plant, wherein the third absorber is configured to promote absorption of hydrogen sulfide by a hydrogen sulfide-selective solvent, and wherein the third absorber is configured to produce an overhead product that is enriched in carbon dioxide and substantially depleted in hydrogen sulfide.

7. The plant of claim 6 wherein the third absorber is configured to produce a third hydrogen sulfide-enriched solvent.
8. The plant of claim 7 wherein the third hydrogen sulfide-enriched solvent is fed to at least one of first and second absorbers.

5 9. A plant comprising:

a first absorber fluidly coupled to a regenerator, wherein the first absorber is configured to promote absorption of hydrogen sulfide by a hydrogen sulfide-selective solvent, and wherein the regenerator is configured to promote formation of a hydrogen sulfide-rich gas from the hydrogen sulfide-selective solvent;

10 a second absorber fluidly coupled to the regenerator, wherein a portion of the hydrogen sulfide-rich gas is fed to the first absorber to thereby increase a hydrogen sulfide concentration in the hydrogen sulfide-rich gas;

15 a Claus plant that receives another portion of the hydrogen sulfide-rich gas and produces a tail gas, wherein the second absorber is configured to receive the tail gas; and

wherein the first and second absorbers are configured to produce an overhead product that is enriched in carbon dioxide and substantially depleted in hydrogen sulfide.

10. The plant of claim 9 wherein the second absorber is configured to produce a hydrogen sulfide-enriched solvent, and wherein at least a portion of the hydrogen sulfide-enriched solvent is fed to the first absorber.

20 25 11. A method of increasing the concentration of hydrogen sulfide in a gas stream comprising:

separating an acid gas stream in a first absorber to form a first carbon dioxide-rich gas and a first hydrogen sulfide-enriched solvent using a hydrogen sulfide-selective solvent;

separating a first portion of a hydrogen sulfide-rich product gas in a second absorber to form a second carbon dioxide-rich gas and a second hydrogen sulfide-enriched solvent;

combining the first and second hydrogen sulfide-enriched solvents; and

removing hydrogen sulfide from the first and second hydrogen sulfide-enriched solvents to thereby form the hydrogen sulfide-rich product gas.

12. The method of claim 11 wherein the step of combining the first and second hydrogen sulfide-enriched solvents comprises mixing of the first and second hydrogen sulfide-enriched solvents.
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13. The method of claim 11 wherein the step of combining the first and second hydrogen sulfide-enriched solvents comprises feeding at least part of the first hydrogen sulfide-enriched solvent into the second absorber.
14. The method of claim 11 further comprising a step of feeding a second portion of the hydrogen sulfide-rich product gas to a Claus plant.
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15. The method of claim 14 wherein the Claus plant produces a tail gas, and comprising a step of feeding the tail gas to a third absorber that produces a third overhead product that is enriched in carbon dioxide and substantially depleted in hydrogen sulfide, and a third hydrogen sulfide-enriched solvent.
- 15 16. The method of claim 15 wherein the third hydrogen sulfide-enriched solvent is fed to the first absorber.
17. The method of claim 15 wherein the third hydrogen sulfide-enriched solvent is fed to the second absorber.